APPENDIX C

CAPITAL COST: AVIATION COMPONENT OF MODAL ALTERNATIVE

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The total capital costs for the aviation component of the Modal Alternative are presented in Table C-1. Cost breakdown for each airport is presented in Appendix D.

Table C-1
Total Capital Cost for Aviation Component
(Hybrid-Aviation Component)

Airport Name	Improvement Cost
Bay Area	
Oakland International (OAK)	$679,727,000
Norman Y. Mineta San Jose International (SJC)	$5,084,263,000
Northern Central Valley	
Sacramento International (SMF)	$322,469,000
Southern Central Valley	
Fresno (FAT)	$19,703,000
Los Angeles	
Burbank-Glendale Pasadena (BUR)	$3,578,673,000
Ontario International (ONT)	$3,486,581,000
Long Beach Daugherty Field (LGB)	$263,833,000
San Diego	
San Diego International (SAN)	$2,578,673,000
Total	**$16,013,922,000**

In the Modal Alternative, hypothetical capacity improvements (terminal gates, runways, and other associated improvements) were identified at individual airports as representative sites to assess the potential for environmental impacts and to estimate the capital costs. Specific constraints at each airport facility were considered, and capacity improvements were assigned on a case-by-case basis. The numbers of hypothetical new gates and runways allocated to specific airports are presented in Table C-2. Associated Aviation Improvements presented in Table C-3 and Total Programmed, Funded, and Operational Airport improvements Table C-4 are is used in the estimation of the capital costs. The terminal gates and associated improvements are represented in terms of additional passenger terminal area, right-of-way (additional physical footprint), parking spaces (on/off site), and primary lanes of access road.

Table C-2
Aviation Improvements – Year 2020
(Modal Alternative Aviation Component)

Airport	Representative Intercity Demand[a] (Millions)	Additional Gates[b]	Additional Runways[b]
Bay Area			
Oakland (OAK)	14.5	20	1
San Jose (SJC)	11.8	15	1
Northern Central Valley			
Sacramento (SMF)	6.2	6	0
Southern Central Valley			
Fresno (FAT)	1.0	2	0
Los Angeles			
Burbank (BUR)	9.9	19	1
Ontario (ONT)	12.2	8	1
Long Beach (LGB)[c]	4.9	9	0
San Diego			
San Diego (SAN)	7.5	12	1
Statewide Total	**68.0**	**91**	**5**

Source: Parsons Brinckerhoff, November 2002

[a] Aviation based trips only and excludes long-distance commute trips.
[b] Net improvements are calculated as follows. Total Representative Demand minus 2020 Funded and Operational Improvements for California Trips
[c] No additional runway was assumed at Long Beach because of existing available runway capacity.

Table C-3
Associated Aviation Improvements – Year 2020
(Modal Alternative Aviation Component)

Airport	Additional Passenger Terminal Size (sq.ft.)[a]	Additional Lanes on Primary Access Road[b]	Additional Parking Spaces (on/off-site)[c]	Additional Physical Footprint (acres)[d]
Bay Area				
Oakland (OAK)	290,100	1	2,100	330
San Jose (SJC)	438,800	1	1,580	600
Northern Central Valley				
Sacramento (SMF)	106,500	1	630	740
Southern Central Valley				
Fresno (FAT)	26,000	0	210	0
Los Angeles				
Burbank (BUR)	339,500	1	2,000	400
Ontario (ONT)	264,000	2	840	740
Long Beach (LGB)	270,000	1	950	0
San Diego				
San Diego (SAN)	300,000	1	1,260	400
Statewide Total	**2,034,900**	**8**	**9,570**	**3,210**

Source: Parsons Brinckerhoff, November, 2002

[a] Based on number of additional gates and actual terminal area take off estimates.
[b] Based on total passenger trips and an estimate of 2.25 passengers per vehicle, a peak hour factor of 0.45 and FHWA/FAA Airport Ground Access Planning Guide roadway capacity requirements.
[c] Based on 1,400 parking spaces per 1,000,000 annual enplaned passengers.
[d] Based on land required for precision runway safety areas, and 70 Ldn noise for a typical regional jet or narrow body aircraft.

Table C-4
Total Programmed, Funded, and Operational Airport Improvements[a]

Airport	Passenger Terminal Size (square feet)	Runways	Gates	Primary Access Lanes	Parking Spaces (On-/Off-Site)
Bay Area					
Oakland (OAK)	320,000	0	12	2	10,000
San Jose (SJC)	500,000	0	17	2	6,400
Northern Central Valley					
Sacramento (SMF)	250,000	0	14	1	5,000
Southern Central Valley					
Fresno (FAT)	188,000	0	5	1	1,800
Los Angeles					
Ontario (ONT)	800,000	0	24	4	5,000
San Diego					
San Diego (SAN)	200,000	0	8	2	3,000
Statewide Total[b]	**2,258,000**	**0**	**80**	**12**	**31,200**

[a] Total improvements assumed to be programmed, funded, and operational by 2020.

[b] The City and County of San Francisco and the FAA have commenced preparation of an EIR/EIS for a runway expansion/reconfiguration at SFO that may occur before 2020. It is not assumed as part of the No Project improvements since it does not meet the criteria as established.

Sources: Master planning and environmental documents, regional aviation system planning documents, and interviews with local area airport staff and airport planners.

The aviation cost component for the Modal Alternative is based on recent cost information for other airport improvements in California and around the United States. Specific cost assumptions are defined in the cost element descriptions below.

Aviation Cost Elements

The aviation component costs are primarily defined in terms of runways, gates, access roads, demolition/clearing, utility relocation, and right-of-way. There are other improvements (e.g., aprons, taxiways, passenger facilities, etc.) are included based on assumptions regarding their size, extent, or placement. The following assumptions were used for the associated improvements considered for the cost estimate.

A. RUNWAY

Runway:
For regional jets and narrow-body aircraft (i.e., Boeing 737) operating purpose, a minimum runway length of 8000 ft x 150 ft (2438.4 m x 45.72 m) is assumed. The unit cost represents the cost for the airfield pavement, including sub-grade, pavement, shoulders, drainage, lighting, signing, striping, etc. This unit cost includes runways and taxiways.

Site Preparation:
This is the cost for clearing and grubbing to remove unsuitable surface debris and vegetation. This also includes the cost of grading, which is the movement of dirt onsite to prepare the surface for airfield pavement. Site preparation also includes work done to make the site usable after the demolition of existing structures.

The unit cost for site preparation is applied to the runway and taxiway.

Navaids (CAT-1):
This is the cost necessary for navigation aid instruments at each additional runway.

B. GATES

Total terminal size is based on the number of additional gates and on existing terminal area. Average gate capacity is assumed to be 525,000 passengers per year per additional gate.

Passenger Terminal Facilities:
This includes terminal building, circulation within the terminal building, lighting, security measures, and all auxiliary spaces including intermodal connection areas. Spaces are provided within the terminal building for ticket sales, passenger information, airport administration, baggage handling, and a reasonable amount of commercial space (e.g., newsstands, small restaurants, etc.). Passenger terminal costs are expected to vary widely at specific locations due to site constraints and existing terminal configurations. Therefore, the unit cost is representative, based on a rough average of typical terminal size and costs throughout the airports considered.

Costs of site development are also included, such as paving and landscaping around the passenger terminal building, along with the provision of street and roadway modifications necessary to connect access to the site.

Apron:
Includes the airfield pavement cost for airplane parking, airplane maneuvering, support vehicles (fuel, baggage, concession), and passenger holding area. It is estimated that a total of 45,000 sq. ft (0.42 hectares) of parking apron would be required at each gate. This unit cost includes airfield pavement, sub-grade, drainage, lighting, signing, striping, etc.

Apron Site Preparation:
The site preparation for the parking apron is estimated in the same manner as runways. The area would be prepared for airfield pavement. It is estimated that a total of 45,000 sq. ft (0.42 hectares) of parking apron would be required at each gate.

Passenger Loading Bridge:
This includes the cost to furnish and install a passenger loading bridge (jetway).

C. PARKING FACILITIES

Parking:
The standard airport planning ratios for public parking at airports (reference) is 1,400 spaces for each 1,000,000 annually, including both originating and departing passengers. To obtain the total number of parking spaces needed, the total number of parking spaces added to existing for the No Project Alternative is subtracted from the number of parking spaces calculated using the above ratio. This number does not include rental car and employee parking spaces. Unit cost includes all facility costs associated with the construction of the parking structures, including right-of-way.

D. ACCESS ROADS

Primary Access Roads:
Using the annual representative intercity demand, a peak-hour enplaned and deplaned demand was calculated based on the Federal Aviation Administration (FAA) formula of 0.045 total peak-hour passengers (TPHP) as a percent of annual flow. An estimated 2.25 persons per vehicle is assumed for all of the airports to forecast the number of cars accessing the airport. Access road capacity requirements were estimated using the above numbers and the Highway Capacity Manual. Number of lanes is rounded to the nearest full lane for each airport. The length of the additional lane is assumed to be 1 mi (1.609 m) long.

The unit costs applied for these roads include all of the cost elements necessary to complete the construction of the primary road such as earthwork, traffic handling, landscape, right-of-way, mobilization, drainage, signs, signals, lighting, etc.

Demolition/Clearing

This estimate is based on any demolition/clearing needed for the additional physical footprint outside of existing right-of-way required at each airport. For this level of planning, no internal airport improvements, such as reconfiguration of existing circulation patterns or terminal gates, are included.

A. OPEN LAND CLEARING

The costs for clearing and grubbing includes the removal of unsuitable surface debris and vegetation, and the cost of grading, which is the movement of dirt onsite to prepare the surface for construction. Site preparation also includes work done to make the site usable after the demolition of existing structures.

Unit costs for open land clearing are applied to the required additional physical footprint (total area). The physical footprint is based on the land required for precision runway safety, and within the noise level of 65 Ldn for a typical regional jet or narrow-body aircraft.

B. DEMOLITION CLEARING/DEVELOPED PROPERTY

For this cost estimate purpose, it is assumed that the required physical footprint is occupied by large buildings that need to be demolished in order to construct new runways and gates.

C. UTILITY RELOCATION

Utility Relocation:
This includes the cost of major utility relocations that must be done before constructing the facilities, such as overhead power lines, pipelines, sewers, fiber optics, and underground ductbanks. Different unit costs were applied to each airport based on the intensity of land use development around the existing airport. Using U.S. Geological Survey (USGS) planimetric information, field reconnaissance, and other mapping sources, each airport was categorized in a land use density category for estimating purposes (dense urban, urban, dense suburban, suburban, and undeveloped). Also, in order to bring more consistency between the Modal Alternative and HST Alternative capital cost estimates, the utility relocation unit cost for airports uses the same utility relocation unit cost developed for the HST Alternative.

Right-of-Way Items

A. LAND ACQUISITION

It is assumed that the area within 1 mi (1.609 m) from the end of the proposed runways, and 1,000 ft to the side and parallel to the runway, would be acquired for safety and environmental purposes. This area includes the land required for precision runway safety and the 70Ldn noise contour for a typical regional or narrow-body aircraft.

The total cost associated with the purchase of land and/or easement rights for the additional physical footprint includes relocation assistance, demolition, title searches, appraisals, legal fees, title insurance, surveys, and various other processes. Property values and acquisition costs can range from quite modest in undeveloped areas to quite significant in areas of high-value commercial properties.

The same methodology used in estimating utility relocation cost was used in estimating airport right-of-way cost. Each airport was categorized by geographical region, and the HST Alternative right-of-way cost for similar categories was used in estimating airport right-of-way cost.

Environmental Impact Mitigation

This represents the total cost associated with potential mitigation of environmental impacts such as impacts to wetlands, parklands, biological resources, and wildlife habitat.

The total cost of environmental mitigation is estimated to be 3% of the line construction costs (i.e., runway, gates, structures, roads, utilities, etc.) for each airport. This factor is not derived from airport projects; instead, it is applied to be consistent with the HST Alternative capital cost estimate.

Program Implementation Costs

Costs for these elements are computed as a percentage of total construction and procurement costs. The percentages are intended to represent the average overall cost of these implementation items. The percentage factors were developed for the HST Alternative and applied consistently for both the Modal and HST Alternatives. These costs are included in the cost estimates for overall consistency between alternatives, and to more appropriately estimate order of magnitude of the total costs.

A. PRELIMINARY ENGINEERING AND ENVIRONMENTAL REVIEW

These costs represent preliminary engineering to approximately a 35% design level. This would include geotechnical investigations, land surveying and mapping, engineering, architecture, landscape architecture, traffic engineering, right-of-way engineering and preparation of preliminary plans and analyses in all necessary technical disciplines, various other technical studies, and the draft and final environmental document for project-level review. The environmental review would entail all studies and analyses necessary to complete further federal and state required environmental documents. (2.5%)

B. PROGRAM AND DESIGN MANAGEMENT

This includes costs for the overall management and administration of the project. Included are program manager's office, contract management and administration, project control (including both cost and schedule), general administration, computer support, quality assurance, configuration management, system safety, publications, public relations, support of the bidding process, agency liaison, community information and involvement, and legal support. (5%)

C. FINAL DESIGN

This includes costs for final design and preparation of construction and procurement documents for all facilities and systems, such as geotechnical investigations, land surveying and mapping, engineering, architecture, landscape architecture, traffic engineering, right-of-way engineering, preparation of plans and specifications in all necessary technical disciplines, and various other technical studies and support of the final design process. Design support during construction, including shop drawing review, is also included in this item. (5%)

D. CONSTRUCTION AND PROCUREMENT MANAGEMENT

This includes costs for all management of construction and procurement work after contracts are awarded to contractors or suppliers, such as onsite inspection in factory and field, quality control, contract administration, and acceptance inspection. (5%)

E. AGENCY COSTS

This includes costs of maintaining the owner's (probably airport authorities) organization during the entire program, whether that owner is a franchisee or a government agency. (1%)

F. FORCE ACCOUNT COSTS

Cost includes the services of other organizations or agencies of local, state, or federal government that may be required to support the project. (1%)

G. RISK MANAGEMENT

This includes costs of owner (probably airport authorities)-supplied insurance or any other allowances decided to be applied for the management of risk to the owner. (6%)

Contingencies

A contingency is added as a percentage of overall project costs, based on past experience for projects in early stages of definition. Contingencies should not be considered as potential savings. They are an allowance added to a basic estimate to account for items and conditions that cannot be assessed at the time of the estimate. The contingency amount is expected to be reduced as the project matures. The contingency is estimated at 25% of the total of construction costs.

Aviation Unit Costs

Unit costs for each of the aviation cost elements are presented in Table C-5.

Table C-5
Airport Unit Costs

Cost Elements			Unit	Unit Price
Runway				
	1	Runway	ea	$20,000,000.00
	2	Site Preparation	Hectares	$12,355
	3	Navaids (CAT-1)	ea	$2,000,000.00
Gates				
	1	Passenger Terminal Facilities	m2	$4,305.56
	2	Apron	ea	$750,000
	3	Apron Site Preparation	Hectares	$12,355

	4	Passenger Loading Bridge	ea	$400,000
Parking				
	1	Parking Spaces (All Structure Parking)	ea	$15,000
Access Roads				
	1	Additional Lanes on Primary Access Roads	km	$218,723
Demolition/Clearing (does not include internal airport improvements)				
	1	Open Land Clearing	Hectares	$12,355
	2	Clearing of Developed Land	Hectares	$8,611,128
Utility Relocation				
	1	Major Utility Relocations - Dense Urban	Hectares	$497,711
	2	Major Utility Relocations - Urban	Hectares	$380,393
	3	Major Utility Relocations - Dense Suburban	Hectares	$266,631
	4	Major Utility Relocations - Suburban	Hectares	$76,434
	5	Major Utility Relocations - Undeveloped	Hectares	$3,911
Right-of-Way				
	1	Right-of-Way - Dense Urban	Hectares	$3,499,093
	2	Right-of-Way - Urban	Hectares	$2,332,729
	3	Right-of-Way - Dense Suburban	Hectares	$1,166,364
	4	Right-of-Way - Suburban	Hectares	$408,227
	5	Right-of-Way - Undeveloped	Hectares	$291,591
Environmental Mitigation				
	Environmental Mitigation		3% of Construction Cost	
Program Implementation Costs				
	Program Implementation Costs		25.5% of Total Cost	
Contingencies				
	Contingencies		25% of Total Cost	